



AMPEX

MR-70

The World's Most Advanced Master Recorder

*Establishing new standards of performance, reliability
and operating convenience in master recording.*



The MR-70 Master Recorder is the result of three years of research, testing, and development, during which Ampex engineers worked closely with key individuals in the Recording Industry. Their common objective was to establish new standards of performance, reliability and operating convenience in a master recorder. The result is the Ampex MR-70—a totally new master recorder—with major design innovations that meet the exacting requirements of the Recording Industry.



PERFORMANCE

The MR-70 has no equal in total performance. No effort was spared in its design and development to fulfill the demands of the recording industry in producing the finest quality mono-phonetic and stereo masters.

- With today's low noise tapes, an improvement in broad-band (20 cps to 15 kc) signal-to-noise ratio of 10 db is realized over previous specifications.
- The electronics of the MR-70 are capable of even higher performance with future tape improvements.
- Frequency modulation noise ("scrape flutter") is virtually eliminated through unique design of the head assembly, employing a precision idler in the critical unsupported tape path, reducing the unsupported tape path length. (A)
- Components are permanently aligned to the most rigid and massive heavy-ribbed casting ever used in an audio recorder, assuring stability and precision of tape motion and tape tracking throughout the long life of the recorder. (B)
- Tape speed is "repeatable" and identical from reel to reel, and from day to day, even if recorder is moved between recording sessions.
- A constant hold-back tension system maintains constant tape speed and alignment from beginning to end of reel. (C,C₁)
- Viscous damped reel idler (a "floating" flywheel in an oil-filled shell) reduces wow. (D)
- Dynamic range is assured by generous electronic overload margin. Record amplifier:
Distortion, 25 db above operating levels, is less than 1% from 30 cps to 15 kc.
- Reproduce amplifier:
Distortion, at tape saturation level (14 db above operating level), is less than 1% from 30 cps to 15 kc.

■ A balanced 150 kc master oscillator in the transport drives a feedback-stabilized bias and erase amplifier in each electronics, and maintains low noise and absence of even order distortion. The resulting symmetrical bias waveform eliminates the need for a "noise balance" control. The 150 kc bias frequency minimizes audible beats between the bias and the harmonics of high frequency signals.

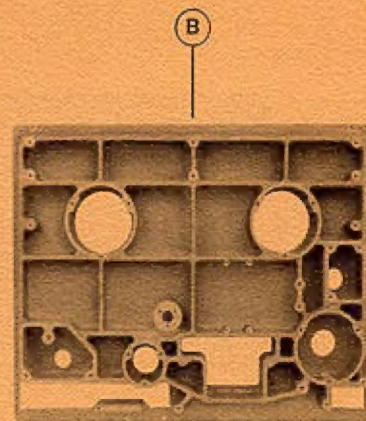
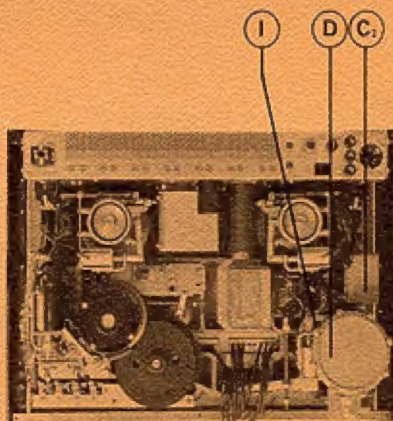
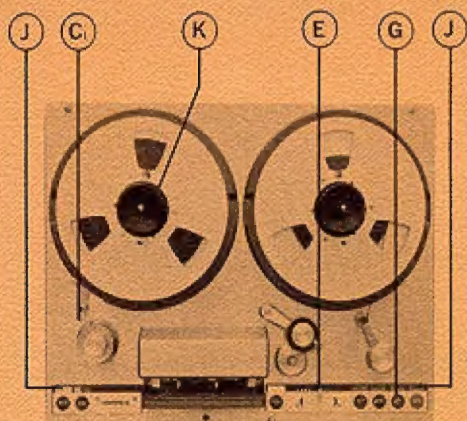
■ Stray bias signals in the output line are kept 40 db below operating level.



OPERATIONAL FEATURES

Convenience and ease of operation are key advantages of the MR-70. From variable speed winding and rewinding to facilities for easy editing, the MR-70 was designed with the operator in mind.

- Convenient variable-speed wind/rewind (from creeping to 400 ips in either direction) for easy locating and editing. (E)
- Fully automatic tape lifters; manually retractable at any time. (F)
- Easy editing foot pedal (optional), or panel push-button (G) further simplify the editing function by: (1) releasing brakes in "stop" to permit hand movement of tape; (2) stopping take-up reel in "play" to allow tape to "spill" if desired; (3) cancelling tape lifters.
- Drop down gate provides full access to heads for easy cleaning, demagnetizing, and editing. (H)
- Fast, positive starts are guaranteed by supplying power (I) boost to reel idler and take-up motors during start function.
- Easy-to-see illuminated push-button controls for all functions. (J)
- Either U. S. (NAB and EIA) or European (CCIR) type reel can be used. (K)





Convenient remote control (optional) features include:

- .. Operation of all functions of record, play, fast forward, rewind, stop, and even gate-close in fast mode.
- .. Indicator lights showing mode condition of recorder.
- .. Remote operation of the output selector (A-B) functions.
- .. Remote control of recording and reproducing levels.

Built-in switching circuitry for Sel Sync* (see Sel Sync under accessories. (L)

When the tape speed is selected on the transport, relays automatically switch to the proper equalization in the electronics. A high-frequency response selector switch allows selection of three different post-emphasis characteristics for each speed: for 15 ips, NAB (50 microseconds), CCIR (35 microseconds), or AME†. In the 7 1/2 ips or 30 ips speed position, any three post-emphasis characteristics from 17.5 to 100 microseconds may be pre-adjusted and then selected as desired. A separate switch controls the low end at each speed so that the 3180 microsecond low frequency pre- and post-emphasis may be switched in or out as required. Adjustments have sufficient range to accommodate equalization curves other than the labeled function. For example, the CCIR position could be re-adjusted to be a position for NAB post-emphasis, and pre-emphasis for high output tape.

Excellent stability and repeatability of performance under environmental or line voltage extremes improved by:

- .. Conservative design using only premium quality components.
- .. Stabilized circuitry — maintained by generous amount of feedback.
- .. High torque, high stability potentiometers which minimize changes due to shock or environments.
- .. Positive locks on record and reproduce level controls prevent accidental change of settings. (M)
- .. See last page for operational features of new Console Cabinet.



RELIABILITY

Long term, "year-in-year-out" dependability provided by use of high quality components, life testings, and Ampex leadership and experience in the design and manufacture of precision magnetic recorders for audio, video, instrumentation and computer applications.

High grade (ABEC class 7) ball bearings are used in all critical areas.

■ Maximum reliability and performance are obtained through use of military/industrial grade nuvistors which: (N)

- .. Are 10 to 20 times more reliable than conventional vacuum tubes.
- .. Have a dynamic range that exceeds that of transistors, and provides greater safety margin for overloads.
- .. Are rugged and reliable under shock and overload conditions.
- .. Have closely controlled performance parameters (usually falling within $\pm 10\%$).
- .. Require only TWO types of nuvistors which greatly reduces spare parts requirements.

■ Newly designed precision head assembly guarantees perfect alignment throughout life of recorder. Fixed azimuth and zenith. **No adjustment is necessary for the life of the heads.** (Adjustable playback heads are available.) All head stacks are individually replaceable, and the same assembly can accommodate either 1/4, 1/2, or 1 inch stacks. (O)

■ Non-corrosive gold contacts are used on all switches and relays for dry circuits. Silver or palladium is used for high level circuits.

■ Exacting quality control standards, life-testing procedures, superior components, and a large portion of Ampex experience have combined to make the MR-70 the world's most reliable master recorder.



MAINTAINABILITY

The MR-70 is designed throughout for minimum maintenance. Periodic preventive care is simplified to require minimum time and expense.

■ Modular design, front panel adjustments and high quality components all add up to easy maintenance for the MR-70. (P)

■ Plug-in electronic modules provide easy accessibility and maintainability of power dissipating functions. The record head drive and line output are accomplished with identical plug-in output amplifiers. The bias amplifier, master bias oscillator and Sel Sync* preamplifier are also modular. (Q)

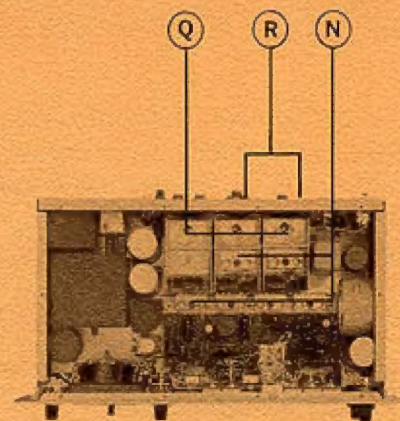
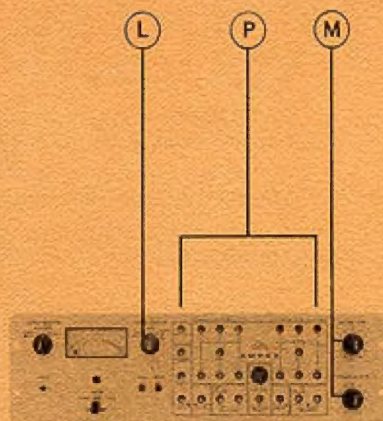
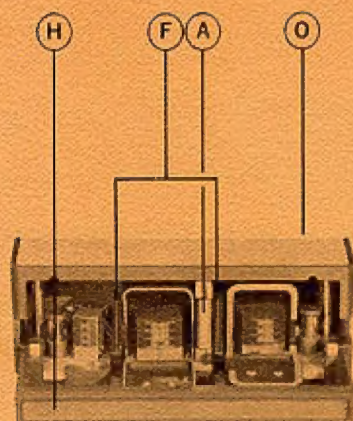
■ Rugged nuvistors are not damaged by accidental overload during servicing. (N)

■ Test jacks are provided so that playback and record channels may be quickly and easily checked with instruments without disconnecting equipment. (R)

■ See last page for maintenance features of new Console Cabinet.

*Sel Sync (Selective Synchronization) TM Ampex Corp.

†Ampex Master Equalization



A TOTALLY NEW MASTER RECORDER



With Major Design Innovations to Meet the Exacting Standards of the Recording Industry

In addition to the many advanced design features in tape transport and electronics, the MR-70 provides many **basic advantages in overall design concept**... advantages essential to the **compatibility and flexibility** requirements of modern master recording techniques and procedures:

1. The ability to record up to **eight channels** on one recorder.
2. Uses standard width tape — $\frac{1}{4}$, $\frac{1}{2}$, or 1 inch.
3. Heavy cast frame to guarantee perfect alignment of components.
4. Easy, familiar editing procedures to reduce possibility of error.
5. Has its own erase head — tapes do not have to be "bulk" erased.
6. Built-in safety braking feature to keep tape from spilling in case of power failure or emergency.
7. The important ability to provide "sound-on-sound" recording or "over-dubbing."
8. Maintains compatibility with existing tape libraries.

ACCESSORIES FOR THE MR-70

STUDIO CONSOLE The compact, convenient console designed for the MR-70 offers many advantages and desirable features for the Master Recordist.

- The transport is mounted on a frame that will tilt to three different operating positions.
- The unit may also be tilted to a vertical position for easy maintenance and service.
- With plug-in cables removed the entire unit will swing through a 360° arc.
- The transport may be removed from the console by simply sliding along channels.
- Positive position locking of transport is maintained with self-locking sliding bolt.
- Front panel of the transport is hinged and may be released by two push-button catches. Simplifies adjustments when required.
- The console is beautifully finished on all sides (including the back), so it need not be placed against a wall to hide unsightly appearance. All cables are housed, and come into the console at floor level.
- Tough vinyl finish, in simulated walnut grain, will remain new looking even after years of constant service.
- Sheppard casters provide easy movement. Front two are locking type.
- For ease in shipment and lower freight costs, console may be easily dismantled before shipping if desired.

SEL SYNC* Sel Sync is an equalized plug-in playback pre-amplifier that allows the recording head to be used as a playback head. Incorporates 50 microsecond post-emphasis characteristics plus compensation for gap loss of record head.

EDITING FOOT PEDAL This is a valuable accessory for any master recordist. It frees the operator's hands during editing

operations by performing the following functions:

1. In **STOP MODE**: While the pedal is depressed, the reel brakes are released, a light hysteresis braking is applied, and the headgate is closed for easy editing and spot locating. Transport automatically returns to STOP when pedal is released.
2. In **PLAY MODE**: While the pedal is depressed, the take-up reel is stopped and the safe-switch is disabled to allow "spilling" tape. Transport stops when pedal is released.
3. In **FAST MODE**: While pedal is depressed, the headgate is closed; the gate opens when the pedal is released.
4. In **RECORD MODE**: The foot pedal is completely disabled and cannot interrupt a recording.

(Editing Push-Button is used when the foot pedal cannot be installed. Functions are the same as for the foot pedal, except that the editing circuit "holds" when the push-button is depressed and can only be released by pressing the "stop" button.)

MODEL OPTIONS

STANDARD MODELS	All with in-line heads; dual speed 7½–15 ips, or 15–30 ips.
MR-70-1	Single-channel (full track), $\frac{1}{4}$ " tape
MR-70-2	Two channel, $\frac{1}{4}$ " or $\frac{1}{2}$ " tape width
MR-70-3	Three channel, $\frac{1}{2}$ " or 1" tape width
MR-70-4	Four channel, $\frac{1}{2}$ " or 1" tape width
SPECIAL MODELS	MR-70-6 and 8 Six and eight channel 1" tape

SPECIFICATIONS See insert #2162S for complete performance specifications.

MORE INFORMATION AVAILABLE

Further technical information about the design of the MR-70 Master Recorder may be found in the following papers available from Ampex Corporation, Dept. 6-1, 401 Broadway, Redwood City, California.

1. "Performance and Reliability Requirements for a Master Tape Recorder," *Journal Audio Engineering Society* 12, 274–279 October 1964. R. Narma and W. M. Fujii.
2. "Dynamic Range Limitations in Tape Recording," *Journal Audio Engineering Society* 12, 294–297 October 1964. R. Z. Langevin.
3. "Noise Limitations in Tape Reproducers," *Journal Audio Engineering Society* 12, 280–293 October 1964. E. P. Skov.
4. "Mechanical Damping in Tape Transports," *Journal Audio Engineering Society* 12, 140–146 April 1964. J. G. McKnight.

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MR-70

MASTER RECORDER SPECIFICATIONS

TAPE WIDTH AND CHANNEL CONFIGURATION AVAILABLE:

- ¼" tape — 1 or 2 channels
- ½" tape — 3, or 4 channels
- 1" tape — 4, 6, or 8 channels

TAPE SPEEDS AVAILABLE: 7½ and 15 ips, or 15 and 30 ips.

REEL SIZE: 11½" maximum, EIA, NAB or CCIR reels, or hubs; CCIR reel adaptors available.

INPUT: 20K ohms unbalanced convertible to 20K ohms balanced with the addition of a plug-in bridging transformer. Will accept line levels from -20 to +12 vu. Low impedance microphone input by use of accessory plug-in Nuvistor pre-amp.

OUTPUT: Strappable for 150 or 600 ohms, balanced or unbalanced, with nominal line levels of +4 vu or +8 vu.

EQUALIZATION: Equalization switching automatic by transport speed selector. Choice of curves at each speed provides for NAB, CCIR, or AME (15 ips only) as well as adjustments to accommodate other curves in the 17.5 to 100 microsecond range with or without the 3180 microsecond low frequency pre- and post-emphasis.

ELECTRONICS: Completely Nuvistorized; only 2 types of military/industrial grade Nuvistors are used, 6 each type 7587 and 12 each 7895 per channel of electronics;
4 each type 7895 in master bias/erase oscillator.

OVERALL FREQUENCY RESPONSE:

15 ips NAB ± 1 db 50 cps to 15 kc, ± 2 db 30 cps to 20 kc.

7½ ips NAB ± 1 db 50 cps to 12 kc, ± 2 db 40 cps to 15 kc.

SIGNAL-TO-NOISE RATIO:

Peak Record Level to Unweighted Noise (db)*	Full Track ¼" Tape (0.234 Trk Width)	4-Track 1" (0.180 Trk Width)	3-Track ½" Tape (0.100 Trk Width)	2-Track ¼" Tape (0.075 Track Width)
			6-Track 1" (0.095 Trk Width)	4-Track ½" Tape (0.070 Track Width)
				8-Track 1" Tape (0.070 Track Width)
15 ips NAB	70	69	66	65
7½ ips NAB	70	69	66	65
30 ips (17.5 μ s)	72	71	68	67

*Peak Record Level is defined as the level of a long wavelength signal whose remanent flux is 6 db above that of Ampex operating level. On typical tape this corresponds to the 3% third harmonic distortion level. Unweighted noise measured with a filter whose response is -3 db at 30 cps and 15 kc with an 18 db per octave roll-off above 15 kc using 201-type low noise tape biased for maximum sensitivity at 15 mil wavelength.

30 ips (17.5 microseconds) full track heads ± 1 db 50 cps to 20 kc.

30 ips (17.5 microseconds) multi-track heads ± 1 db 100 cps to 20 kc, ± 2 db 50 cps to 20 kc.

BIAS/ERASE OSCILLATOR: Plug-in master oscillator on transport; 150K cps nominal bias/erase frequency.

TAPE LIFTERS: Automatically lifts tape from heads in fast wind modes; edit switch cancels lifters.

ERASURE: A mid-frequency signal recorded at peak record level will be reduced at least 68 db by the erasing system. Ferrite erase head is utilized.

CHANNEL SEPARATION: When recording with signal on one track and without signal on an adjacent track (bias only), the signal-to-crosstalk ratio will be greater than 50 db mid band.

EVEN ORDER DISTORTION: The second harmonic distortion of a 500 cps signal recorded at peak record level (approximately 3% third harmonic distortion) will be less than 0.5%.

FLUTTER AND WOW:

15 ips less than 0.05% rms

7½ ips less than 0.08% rms

30 ips less than 0.05% rms

Measured according to ASA Z57.1-1954 measuring all components from 0.5 cps to 250 cps.

START TIME: (to stable tape motion) Tape will be within $\pm 0.2\%$ of nominal speed in 0.5 seconds.

TIMING ACCURACY: Better than $\pm 0.15\%$.

FAST MODES: Continuously variable from 0 to 400 ips. Rewind time approximately 80 seconds for 2400-foot reel.

ELECTRONIC OVERLOAD MARGIN:

Record Amplifier: Total harmonic distortion less than 1% at 50 cps to 15 kc at a constant record current 25 db above a mid-frequency operating level signal.

Reproduce Amplifier: Total harmonic distortion less than 1% at 50 cps to 15 kc at tape saturation level (14 db above operating level).

OPERATING CONTROLS:

- Input and output level controls continuously variable with twist lock. Levels are remotely controllable.
- Record selector, 3 position for "Ready," "Safe" and "Selective Synchronization."
- Output selector, 3 position for "Input," "Reproduce" and "Remote A-B" monitor.
- Meter selector, 3 position for "Output," "Bias" or "Erase."
- Mode controls: illuminated pushbutton for power on-off, speed, stop, fast wind, play, edit, record; all remotely controllable.
- Variable fast forward-rewind control (0 to 400 ips) lever bar; not remoteable.

DIMENSIONS AND WEIGHTS:

Transport 19" x 24½" x 12" deep 130 lbs.
27 lbs.
Electronics 19" x 5¼" x 12" deep (per channel)
29" wide x 29¼" deep 180 lbs.
Console x 62¼" high (4 channel unit)
Transport & Electronics may be rack mounted.

POWER REQUIREMENTS: Universal voltage transformer
Strappable for 115 volts or 230 volts,
Adjustable by switch for ±12 volts providing nominal voltages of 103, 115, 127, 218, 230 or 242.
Versions for 50 or 60 cps available.

CURRENT DRAIN

1 channel machine	115 volts	2.5 amperes,
	230 volts	1.25 amperes
2 channel machine	115 volts	3.0 amperes,
	230 volts	1.5 amperes
3 channel machine	115 volts	3.5 amperes,
	230 volts	1.75 amperes
4 channel machine	115 volts	4.0 amperes,
	230 volts	2.0 amperes

OPTIONAL ACCESSORIES

- Sel Sync® plug-in amplifier (one required per channel) Cat. #4012107-01
- Editing foot pedal Cat. #4012121-01
- Console cabinet Cat. #4010034-01, 02, 03 or 04, depending upon the number of channels.
- 40 db Nuistor mic plug-in pre-amp Cat. #40196440-01
- 60 db Nuistor mic plug-in pre-amp Cat. #40196440-04
- Balance bridge input transformer Cat. #4850116-01
- Balanced line input transformer Cat. #4850116-02

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METRIC CONVERSION TABLES

TAPE SPEEDS

ips	1½	3¼	7½	15	30	60	120
cm/sec	4.76	9.52	19.05	38.1	76.2	152.4	304.8

TAPE DIMENSIONS

Reels: inches	14	10½	7	5½	5
cm	35.56	26.67	17.78	14.62	12.70
Widths: inches	¼	½	¾	1	2
cm	0.635	1.27	1.905	2.54	5.08

Base Thicknesses: inches	1 mil	1.5 mil
mm	0.0254	0.0381

TAPE DIMENSIONS (Continued)

Length: feet	600	1200	1800	2500	3600	5000	7200	9600
meters	185	366	549	762	1097	1524	2195	2926

HEAD DIMENSIONS

Gap Scatter	Interstack Spacing*	Track Width & Spacing*
microinches	inches 1.5 ±0.0005	inches 0.050 0.070
mm	cm 3.81 ±0.00127	mm 1.27 1.778
		*(IRIG)

STANDARD PANELS FOR 19-INCH (48.26 cm) RACK

in.	1¼	3¼	5¼	7	8¼	12¼	14	15¼	17½	19¼	21	35
cm	4.45	8.89	13.34	17.78	22.23	31.12	35.56	40.01	44.45	48.9	53.34	88.9

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MR-70 SERIES MASTER RECORDERS/REPRODUCERS

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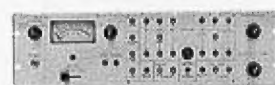
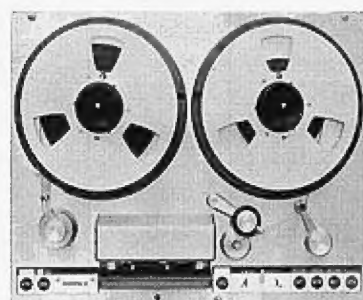
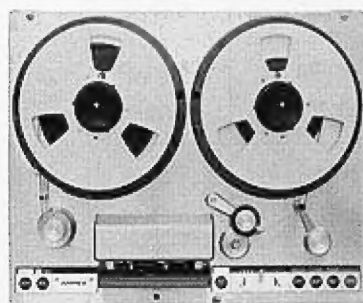
MR-70

PRICE SCHEDULE #A-125 SUPERSEDES #2079-A

EFFECTIVE OCTOBER 1, 1966

Engineered and designed specifically for the master recording industry. Major design innovations have provided significant advances in electric and mechanical performance: (1) with today's low noise tapes, an improvement in broad-band (20 cps to 15 kc) signal-to-noise ratio of 10 db is realized over previous specifications, (2) major reduction in electronic distortion, (3) built-in capability

for still higher performance with future tape improvements, (4) greatly improved tape motion, (5) maximum reliability through use of industrial/military grade nuvistors, (6) fully compatible with other 1/4 inch and 1/2 inch Ampex recorders, (7) human-engineered for easy loading and editing. See MR-70 Product Brochure for complete information on features and specifications: (Lit. #2162)



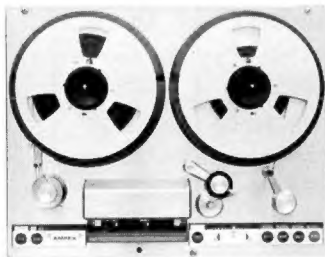
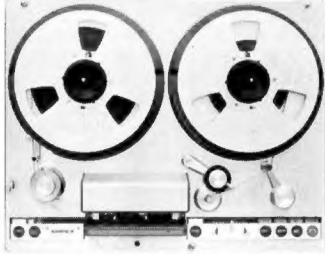
Tape Width No. Channels	Tape Speeds	Playback Azimuth	Mounting	Order by Catalog Number	Professional User Price
1/4 inch One channel	7 1/2 & 15 ips	Variable	Unmounted	4017011-01	\$4005.00
			Console	4017011-03	4410.00
	15 & 30 ips	Fixed	Unmounted	4017011-05	4050.00
			Console	4017011-07	4455.00
		Variable	Unmounted	4017011-09	4005.00
			Console	4017011-11	4410.00
1/4 inch Two channel	7 1/2 & 15 ips	Variable	Unmounted	4017012-01	5175.00
			Console	4017012-03	5625.00
	15 & 30 ips	Fixed	Unmounted	4017012-05	5220.00
			Console	4017012-07	5670.00
		Variable	Unmounted	4017012-09	5175.00
			Console	4017012-11	5625.00
1/2 inch Two channel	7 1/2 & 15 ips	Fixed	Unmounted	4017012-17	5355.00
			Console	4017012-19	5850.00
	15 & 30 ips	Fixed	Unmounted	4017012-21	5355.00
			Console	4017012-23	5805.00

NOTES:

- For 50 cycle versions, add -01 to the 60 cps catalog number; i.e.: 50 cps version of 4017011-01 is 4017011-02 — price is the same.
- For 230 volts, add "X" after the catalog number and in description add: "Strap for 230 volts;" i.e.: the 230 volt 50 cps version of 4017011-01 is 4017011-02X — price is the same.
- Voltage on standard recorders is 115 volts AC. Selector switch enables operation from 105 or 125 volts. Models strapped for 230 volts have switch for operation from 220 or 240 volts.

Ampex equipment may be purchased or leased under special Ampex finance plans.

MR-70 SERIES MASTER RECORDERS/REPRODUCERS



Tape Width No. Channels	Tape Speeds	Playback Azimuth	Mounting	Order by Catalog Number	Professional User Price	
½ inch Three channel	7½ & 15 ips	Variable	Unmounted Console	4017013-01 4017013-03	\$6255.00 6885.00	
		Fixed	Unmounted Console	4017013-05 4017013-07	6300.00 6930.00	
	15 & 30 ips	Variable	Unmounted Console	4017013-09 4017013-11	6255.00 6885.00	
		Fixed	Unmounted Console	4017013-13 4017013-15	6300.00 6930.00	
	½ inch Four channel	7½ & 15 ips	Variable	Unmounted Console	4017014-01 4017014-03	7425.00 8055.00
			Fixed	Unmounted Console	4017014-05 4017014-07	7470.00 8100.00
15 & 30 ips		Variable	Unmounted Console	4017014-09 4017014-11	7425.00 8055.00	
		Fixed	Unmounted Console	4017014-13 4017014-15	7470.00 8100.00	
1 inch Four channel		7½ & 15 ips	Fixed	Unmounted Console	4017014-17 4017014-19	7650.00 8280.00
		15 & 30 ips	Fixed	Unmounted Console	4017014-21 4017014-23	7650.00 8280.00
Accessories—Plug-in devices, one per channel, except pedal						
Sel-Sync [®] Module				4012107-01	\$ 110.00	
Mic Pre-Amp — 40 db				1-96440-01	45.00	
Mic Pre-Amp — 60 db				1-96440-04	60.00	
Input Transformers						
Bal Bridge				580116-01	14.50	
600 ohm Line				580116-02	14.50	
Editing Foot Pedal				4012121-01	29.50	

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